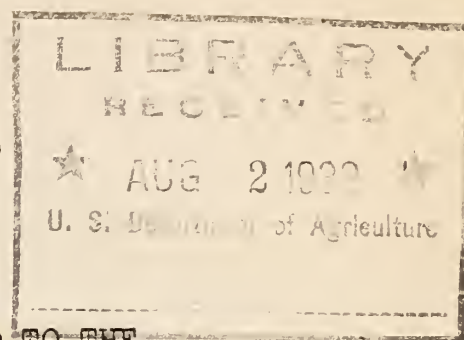


Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1.942
C32 C321

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service



RELATION OF THE AMMONIA CONTENT OF COTTONSEED TO THE
QUANTITY AND QUALITY OF CAKE PRODUCED

By G. S. Meloy, Senior Marketing Specialist,
Agricultural Marketing Service

The Department of Agriculture is frequently asked to explain the relation between the ammonia determinations for cottonseed, as reported by analytical chemists, and the quantity and quality of the cake and meal that cottonseed-crushing mills are able to produce from cottonseed.

In analyzing cottonseed for its protein content, chemists determine either how much nitrogen or how much ammonia can be derived from the seed, and from this determination they are able to calculate the protein content. The calculation of the protein content is not the direct result of analysis. The approved methods of analyzing cottonseed and calculating the standard grades provide that the protein content of seed shall be reported in terms of ammonia. The ammonia is expressed as a percentage and is usually referred to as the ammonia content.

The quality of cottonseed cake and meal is, by the laws of the several States, required to be reported as its content of either nitrogen, ammonia, or protein.

Under the present standard of efficiency in the operation of cottonseed-crushing mills, 94 percent of the ammonia ¹/_{found in} cottonseed, by analysis, should be recovered in the cake.

From this, the following equation for finding the number of pounds of cake of any particular ammonia content per ton of seed may be stated, in which "A" equals the ammonia content of the seed, and "B" equals the ammonia content desired in the cake or meal to be made:

$$\frac{A \times .94 \times 2000}{B} = \text{pounds of cake per ton of seed}$$

¹/ Development of Standards for Grades of Cottonseed. Mimeographed report. Bureau of Agricultural Economics, U.S.D.A. June 1935.

Therefore, if 7 percent ammonia (36 percent protein) cake is to be made, this equation may be reduced as follows:

$$\frac{A \times .94 \times 2000}{7} = \frac{A \times 1880}{7} = A \times 268.57 = \text{pounds of 7 percent cake per ton of seed}$$

For 8 percent ammonia (41.13 percent protein) cake, the equation is reduced as follows:

$$\frac{A \times .94 \times 2000}{8} = \frac{A \times 1880}{8} = A \times 235.0 = \text{pounds of 8 percent cake per ton of seed}$$

For 8.37 percent ammonia (43 percent protein) cake:

$$\frac{A \times 1880}{8.37} = A \times 224.61 = \text{pounds of 8.37 percent cake per ton of seed}$$

And, for 8.76 percent ammonia (45.0 percent protein) cake:

$$\frac{A \times 1880}{8.76} = A \times 214.61 = \text{pounds of 8.37 percent cake per ton of seed}$$

Therefore, when the ammonia content of cottonseed has been determined, there is a very simple way of calculating the number of pounds of cake, of any particular protein content, which any efficient cottonseed-crushing mill should be able to make; for example:

- Multiply 268.57 by the ammonia content of the seed to get the number of pounds of 36% protein cake
- " 235.00 by the ammonia content of the seed to get the number of pounds of 41.13% protein cake
- " 224.61 by the ammonia content of the seed to get the number of pounds of 43% protein cake
- " 214.61 by the ammonia content of the seed to get the number of pounds of 45% protein cake

If the ammonia content of a certain lot of cottonseed has been determined as 3.75 percent, multiply the number given above, for the particular protein content desired, by 3.75 to determine how many pounds of cake can be made per ton of seed. If it is desired to know how much cake containing 41.13 percent protein can be made, multiply 235 by 3.75 and it will be found that a mill should make 881.25 pounds of cake of 41.13 percent protein content per ton of seed. In the same way it can be shown that 1007.14 pounds of cake of 36 percent protein could be made, but only 804.78 pounds of cake of 45 percent protein.

On the other hand, if cake containing 45 percent protein has been made, a mill can add 550 pounds of hull bran (hull bran contains approximately the equivalent of 0.6 percent ammonia) to a ton of such cake, when grinding it into meal, to make 2550 pounds of meal

of 36 percent protein content. Or, if when separating the meats from the hulls, sufficient hulls are left in the meats so that 1007.14 pounds of cake are produced per ton of seed crushed, then that cake should have a protein content of 36 percent if the original seed contained 3.75 percent of ammonia.

During each cotton-producing season beginning with that of 1930-31, the Department of Agriculture has obtained for study the analyses of more than 50,000 samples of cottonseed. From these studies it is apparent that the chief factor influencing the oil content of cottonseed is soil moisture, and that the chief factor influencing the elaboration of protein is sunshine.

During drought seasons the oil content of cottonseed ranges very much below what might be considered normal, and the protein content ranges very much above what might be considered normal. For example, during the drought season of 1930-31 samples of cottonseed were found with oil contents as low as 7.5 percent, and ammonia contents as high as 5.52 percent.

On the other hand, during the season of 1934-35 in those sections where the rainfall was well distributed, oil contents of cottonseed as high as 24.1 percent were found; but during the season of 1933-34 in some sections where almost constantly cloudy weather prevailed, ammonia contents of cottonseed as low as 2.12 percent were found.

An oil content of 7.5 percent indicates a total oil content per ton of seed of 150 pounds, and a content of 24.1 percent indicates that such seed contain 482 pounds of oil per ton. The available oil per ton of seed varies in proportion to the ammonia content of the seed and the standard of efficiency of press-room operation -- the pounds of oil left in the cake produced and lost in the hulls (there is a constant loss of about 4 pounds of oil per ton of seed in the hulls produced) varies from about 50 to 65 pounds per ton of seed crushed. Thus, the available oil (yield) would vary in the above examples from about 85 pounds to about 430 pounds per ton, depending on the efficiency factors mentioned above.

Similarly, it was calculated that 498.2 pounds of cake containing 41.13 percent protein could have been made per ton from the seed that analyzed 2.12 percent ammonia, and that 1297.2 pounds of the same quality cake could have been made per ton from seed that analyzed 5.52 percent ammonia.

During each season the oil content of cottonseed has varied from less than 11 percent to 23 percent, and the yields of oil have varied from about 160 pounds to more than 400 pounds per ton of seed.

The usual range of ammonia content has been from approximately 2.75 percent to approximately 4.80 percent, giving a range in yield of cake (41.13 percent protein content) of from about 646 to 1130 pounds per ton of seed.

SEP 13 1939

M. H.

